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HPV 31 L1 nucleotide sequence alignment.

31 L1 wt	(1)	ATGTCTCTGTGGCGGCCTAGCGAGGCTACTGTCTACCTACCACCTGTCCC
31 L1 partial	(1)	.....
31 L1 total	(1)	.....T.....A.A..ATCT..A.....C.....G.....A.....
31 L1 wt	(51)	AGTGTCTAAAGTTGTAAGCACGGATGAATATGTAACACGAACCAACATAT
31 L1 partial	(51)	.....
31 L1 total	(51)	...C.....G..C..CTCT..C..C.....C..C..CA.....C..
31 L1 wt	(101)	ATTATCACGCAGGCAGTGCTAGGCTGCTTACAGTAGGCCATCCATATTAT
31 L1 partial	(101)	.....
31 L1 total	(101)	.C..C.....T..TTC.....AT..T.G..C..C..T..C.....C..C
31 L1 wt	(151)	TCCATACCTAAATCTGACAATCCTAAAAAAATAGTTGTACCAAAGGTGTC
31 L1 partial	(151)	.....
31 L1 total	(151)	..T..C..A..G.....C..A..G..G..C..C..C.....C..
31 L1 wt	(201)	AGGATTACAATATAGGGTATTTAGGGTTCGTTACCAGATCCAACAAAT
31 L1 partial	(201)	.....
31 L1 total	(201)	T..T..G.....C..A..C..C..A..CA.A..G.....C.....G..
31 L1 wt	(251)	TTGGATTCCTGATACATCTTTATAATCCTGAAACTCAACGCTTAGTT
31 L1 partial	(251)	.....
31 L1 total	(251)	.C..T..C..A..C..C.....C..C..C..A.....C..A.A..G..C
31 L1 wt	(301)	TGGGCCTGTGTTGGTTAGAGGTAGGTAGTCGCGGGCAGCCATTAGGTGTAGG
31 L1 partial	(301)	.....
31 L1 total	(301)	.....T.....C.....G..A..C..A..A..T..A.....G.....C..
31 L1 wt	(351)	TATTAGTGGTCATCCATTATTAAATAATTGATGACACTGAAAACCTCA
31 L1 partial	(351)	.....
31 L1 total	(351)	...CTC.....C.....G..G..C..G..C..C.....C..
31 L1 wt	(401)	ATAGATATGCCGGTGGCCTGGCACTGATAATAGGAAATGTATATCAATG
31 L1 partial	(401)
31 L1 total	(401)	.C.....C..T.....A..T..C..C..C..A.....C..T...

FIG.1A

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31 L1 wt	(451)	GATTATAAACAAACACAACACTGTGTTACTGGTTGCAAACCACCTATTGG
31 L1 partial	(451)
31 L1 total	(451)	..C..C..G....C..T....GT.G....T..G....A..C..
31 L1 wt	(501)	AGAGCATTGGGGTAAAGGTAGTCCTGTAGTAACAATGCTATTACCCCTG
31 L1 partial	(501)	.....
31 L1 total	(501)	T..A..C.....G..TC...A..TC.....C.....A..
31 L1 wt	(551)	GTGATTGTCCTCCATTAGAATTAAAAAATTCAAGTTATAACAAGATGGGGAT
31 L1 partial	(551)	.....
31 L1 total	(551)	...C....A....G....G..G..C..T..C..C....C..T..C
31 L1 wt	(601)	ATGGTTGATACAGGCTTGAGCTATGGATTACTGCTTACAAGACAC
31 L1 partial	(601)	.....
31 L1 total	(601)	....C..C..C..T..C..T.....C..C..C....G.....
31 L1 wt	(651)	TAAAAGTAATGTTCTTGGACATTGTAATTCTATTGTAAATATCCAG
31 L1 partial	(651)	.....
31 L1 total	(651)	C..GTC..C..C..A.....C.....C.....C.....G..C....
31 L1 wt	(701)	ATTATCTTAAAATGGTTGCTGAGCCATATGGCGATACATTATTTTTAT
31 L1 partial	(701)	.....C....C..C..G..C..C..C..C
31 L1 total	(701)	.C..CT.G..G....C....A....C....C..C..G..C..C..C
31 L1 wt	(751)	TTACGTAGGGAACAAATGTTGTAAGGCATTTTTAATAGATCAGGCAC
31 L1 partial	(751)	..G.....A.....G.....C.....C..C..C..C.....C.....
31 L1 total	(751)	..G.....A.....G.....C.....C..C..C..C.....C.....
31 L1 wt	(801)	GGTTGGTGAATCGGTCCCTACTGACTTATATATTAAAGGCTCCGGTTCAA
31 L1 partial	(801)	C..A.....T.....A..C..C.G..C..C..G.....C.
31 L1 total	(801)	C..A.....T.....A..C..C.G..C..C..G.....C.
31 L1 wt	(851)	CAGCTACTTAGCTAACAGTACATACTTCCCTACACCTAGCGGCTCCATG
31 L1 partial	(851)	.C.....CC.G.....TCC..C....C..A..T..ATCT.....
31 L1 total	(851)	.C.....CC.G.....TCC..C....C..A..T..ATCT.....
31 L1 wt	(901)	GTTACTTCAGATGCACAAATTAAATAAAACCATATTGGATGCAACGTGC
31 L1 partial	(901)	..C..C..C..C..T..G..C..C..C..G.....C.....G.....
31 L1 total	(901)	..C..C..C..C..T..G..C..C..C..G.....C.....G.....

FIG. 1B

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31 L1 wt	(951)	TCAGGGACACAATAATGGTATTGTTGGGCATCAGTTATTGTTACTG
31 L1 partial	(951)	A.....T.....C..C.....C.....T..C...C.G..C..G....
31 L1 total	(951)	A.....T.....C..C.....C.....T..C...C.G..C..G....
31 L1 wt	(1001)	TGGTAGATACCACACGTAGTACCAATATGTCGTGCTGCAATTGCA
31 L1 partial	(1001)	....C.....G...TC.....C.....C.....C..T
31 L1 total	(1001)	....C.....G...TC.....C.....C.....C..T
31 L1 wt	(1051)	AACAGTGATACTACATTAAAAGTAGTAATTAAAGAGTATTAAAGACA
31 L1 partial	(1051)	...TC...C.....C..C..GTCCTC...C..C..G.....CC.G....
31 L1 total	(1051)	...TC...C.....C..C..GTCCTC...C..C..G.....CC.G....
31 L1 wt	(1101)	TGGTGAGGAATTGATTACAATTATTCAGTTATGCAAAATAACAT
31 L1 partial	(1101)	.....C...C.G.....C..C..C.....G.....G..C..CC
31 L1 total	(1101)	.....C...C.G.....C..C..C.....G.....G..C..CC
31 L1 wt	(1151)	TATCTGCAGACATAATGACATATATTACAGTATGAATCCTGCTATTTG
31 L1 partial	(1151)	.G.....T.....C.....C..C..C.....C.....C..CC..
31 L1 total	(1151)	.G.....T.....C.....C..C..C.....C.....C..CC..
31 L1 wt	(1201)	GAAGATTGGAATTGGATTGACCACACCTCCCTCAGGTTCTTGGAGGA
31 L1 partial	(1201)	..G..C.....C..C..TC.....T..A..T..C.....
31 L1 total	(1201)	..G..C.....C..C..TC.....T..A..T..C.....A..
31 L1 wt	(1251)	TACCTATAGGTTGTAACCTCACAGGCCATTACATGTAAAAAGTGCC
31 L1 partial	(1251)	.....
31 L1 total	(1251)	C.....C..A..C..C.....T..A..T..C..C.....GTC...T.
31 L1 wt	(1301)	CCCAAAAGCCCAGGAAGATCCATTAAAGATTATGTATTTGGGAGGTT
31 L1 partial	(1301)	.....
31 L1 total	(1301)	.A.....A.....C.....C..G..C..C..C..C.....A..C
31 L1 wt	(1351)	AATTAAAAGAAAAGTTTCTGCAGATTAGATCAGTTCCACTGGGTCG
31 L1 partial	(1351)	.....
31 L1 total	(1351)	..C..G..G.....C.....T..C..G..C..A..C...T.....A.
31 L1 wt	(1401)	CAAATTTTATTACAGGCAGGATATAGGGCACGTCTAAATTAAAGCAG
31 L1 partial	(1401)
31 L1 total	(1401)	A..G..C..G..G..A..T..T..C..A..TA.A..A..G..C..G..T.

FIG.1C

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31 L1 wt (1451) GTAAACGTAGTGCACCCCTCAGCATCTACCACTACACCAGCAAAACGTAAA
31 L1 partial (1451)
31 L1 total (1451)GA.ATC...T..A..T..T.....C..C....T..GA.A..G

31 L1 wt (1501) AAAACTAAAAAGTAA (SEQ ID NO:1)
31 L1 partial (1501) (SEQ ID NO:2)
31 L1 total (1501) (SEQ ID NO:3)

FIG. 1D

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HPV31 L1 total rebuild nucleotide and amino acid sequences.

	M S L W R P S E A T V Y L P P V P
1	ATGTCTTGT GGAGACCATC TGAAGCTACC GTCTACTTGC CACCAAGTCCC
	V S K V V S T D E Y V T R T N I Y
51	AGTCTCTAAG GTCGTCTCTA CCGACGAATA CGTCACCAGA ACCAACATCT
	Y H A G S A R L L T V G H P Y Y
101	ACTACCACGC TGGTTCTGCT AGATTGTTGA CCGTCGGTCA CCCATACTAC
	S I P K S D N P K K I V V P K V S
151	TCTATCCCAA AGTCTGACAA CCCAAAGAAG ATCGTCGTCC CAAAGGTCTC
	G L Q Y R V F R V R L P D P N K F
201	TGGTTTGCAA TACAGAGTCT TCAGAGTCAG ATTGCCAGAC CCAAACAAGT
	G F P D T S F Y N P E T Q R L V
251	TCGGTTTCCC AGACACCTCT TTCTACAAACC CAGAAACCCA AAGATTGGTC
	W A C V G L E V G R G Q P L G V G
301	TGGGCTTGTG TCGGTTTGGGA AGTCGGTAGA GGTCAACCAT TGGGTGTGG
	I S G H P L L N K F D D T E N S N
351	TATCTCTGGT CACCCATTGT TGAACAAGTT CGACGACACC GAAAACTCTA
	R Y A G G P G T D N R E C I S M
401	ACAGATACGC TGGTGGTCCA GGTACCGACA ACAGAGAATG TATCTCTATG
	D Y K Q T Q L C L L G C K P P I G
451	GACTACAAGC AAACCCAATT GTGTTGTTG GGTTGTAAGC CACCAATCGG
	E H W G K G S P C S N N A I T P G
501	TGAACACTGG GGTAAGGGTT CTCCATGTTC TAACAACGCT ATCACCCCCAG
	D C P P L E L K N S V I Q D G D
551	GTGACTGTCC ACCATTGGAA TTGAAGAACT CTGTCATCCA AGACGGTGAC

FIG. 2A

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M V D T G F G A M D F T A L Q D T
 601 ATGGTCGACA CCGGTTTCGG TGCTATGGAC TTCACCGCTT TGCAAGACAC

K S N V P L D I C N S I C K Y P D
 651 CAAGTCTAAC GTCCCATTGG ACATCTGTAA CTCTATCTGT AAGTACCCAG

Y L K M V A E P Y G D T L F F Y
 701 ACTACTTGAA GATGGTCGCT GAACCATAACG GCGACACCTT GTTCTTCTAC

L R R E Q M F V R H F F N R S G T
 751 TTGCGTAGAG AACAGATGTT CGTAAGGCAC TTCTTCAACA GATCCGGCAC

V G E S V P T D L Y I K G S G S T
 801 CGTAGGTGAA TCTGTCCCAA CCGACCTGTA CATCAAGGGC TCCGGTTCCA

A T L A N S T Y F P T P S G S M
 851 CCGCTACCCCT GGCTAACTCC ACCTACTTCC CAACTCCATC TGGCTCCATG

V T S D A Q I F N K P Y W M Q R A
 901 GTCACCTCCG ACGCTCAGAT CTTCAACAAG CCATACTGGA TGCAGCGTGC

Q G H N N G I C W G N Q L F V T V
 951 ACAGGGTCAC AACAACGGTA TCTGTTGGGG TAACCAGCTG TTCGTGACTG

V D T T R S T N M S V C A A I A
 1001 TGGTCGATAC CACCGCGTTCT ACCAACATGT CTGTCTGTGC TGCAATCGCT

N S D T T F K S S N F K E Y L R H
 1051 AACTCTGACA CTACCTCAA GTCCTCTAAC TTCAAGGAGT ACCTGAGACA

G E E F D L Q F I F Q L C K I T L
 1101 TGGTGAGGAA TTCGATCTGC AATTCATCTT CCAGTTGTGC AAGATCACCC

S A D I M T Y I H S M N P A I L
 1151 TGTCTGCTGA CATCATGACC TACATCCACA GTATGAACCC TGCCATCCTG

E D W N F G L T T P P S G S L E D
 1201 GAGGACTGGA ACTTCGGTCT GACCACTCCA CCTTCCGGTT CTTTGGAAAGA

FIG.2B

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T Y R F V T S Q A I T C Q K S A P
1251 CACCTACAGA TTCGTCACCT CTCAAGCTAT CACCTGTCAA AAGTCTGCTC

Q K P K E D P F K D Y V F W E V
1301 CACAAAAGCC AAAGGAAGAC CCATTCAAGG ACTACGTCTT CTGGGAAGTC

N L K E K F S A D L D Q F P L G R
1351 AACTTGAAAGG AAAAGTTCTC TGCTGACTTG GACCAATTCC CATTGGGTAG

K F L L Q A G Y R A R P K F K A G
1401 AAAGTTCTTG TTGCAAGCTG GTTACAGAGC TAGACCAAAG TTCAAGGCTG

K R S A P S A S T T T P A K R K
1451 GTAAGAGATC TGCTCCATCT GCTTCTACCA CCACCCCAGC TAAGAGAAAG

K T K K * (SEQ ID NO:4)
1501 AAGACCAAGA AGTAA (SEQ ID NO:3)

FIG.2C

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SUMMARY OF HPV 31 SEQUENCES.

L1 CONSTRUCT	NUCLEOTIDES	AMINO ACIDS	NUCLEOTIDE IDENTITY	AMINO ACID IDENTITY	COMMENTS
HPV 31 L1 WILD-TYPE	1515	504			
HPV 31 L1 PARTIAL REBUILD	1515	504	92%	100%	121 CHANGES BETWEEN nt 697-1249
HPV 31 L1 TOTAL REBUILD	1515	504	75%	100%	376 CHANGES BETWEEN nt 1-1515

FIG. 3

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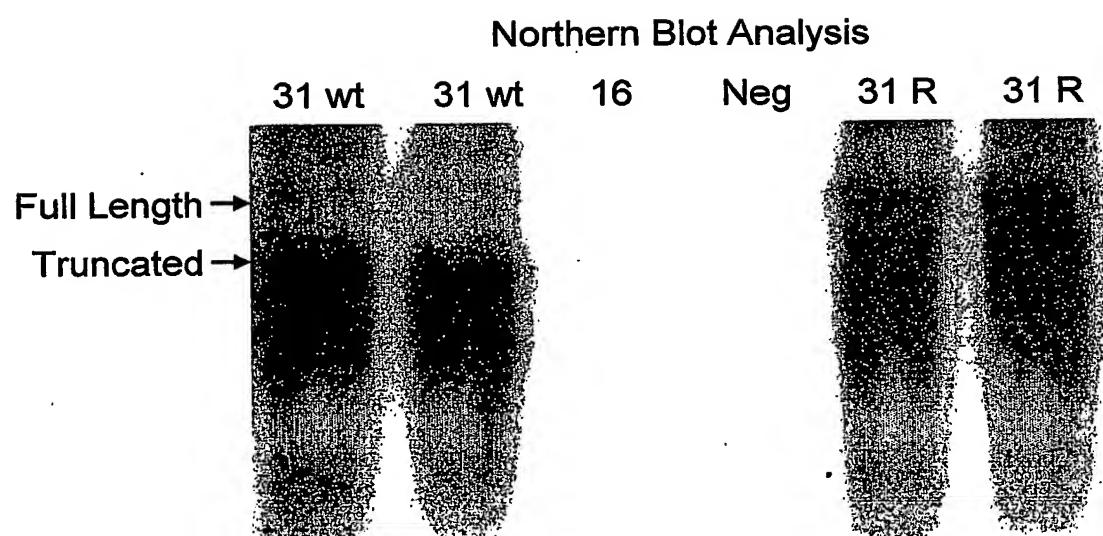


FIG.4

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RESULTS FROM RADIOIMMUNOASSAY

EXP.	L1 CONSTRUCT	PROTEIN CONCENTRATION (mg/ml)	RIA MINUS BACKGROUND (cpm/ml)	31 L1 VLP* / mg protein (cpm/mg)	AVERAGE (cpm/mg)	RATIO (Ave/Ave)
1	31 WILD-TYPE	1.64	414	252	460	1 (31 wt/31 wt)
		1.62	987	609		
		1.82	904	497		
		1.76	844	480		
1	31 PARTIAL REBUILD	1.67	5061	3031	3158	6.9 (31 PARTIAL/31 wt)
		1.55	5091	3285		
2	31 PARTIAL REBUILD	2.27	3901	1719	2095	1 (31 PARTIAL/31 PARTIAL)
		2.27	4081	1798		
		2.38	7135	2998		
		2.38	4428	1861		
2	31 TOTAL REBUILD	2.07	6628	3202	3645	1 (31 TOTAL/31 PARTIAL)
		2.07	8461	4087		

FIG. 5

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Transmission Electron Microscopy

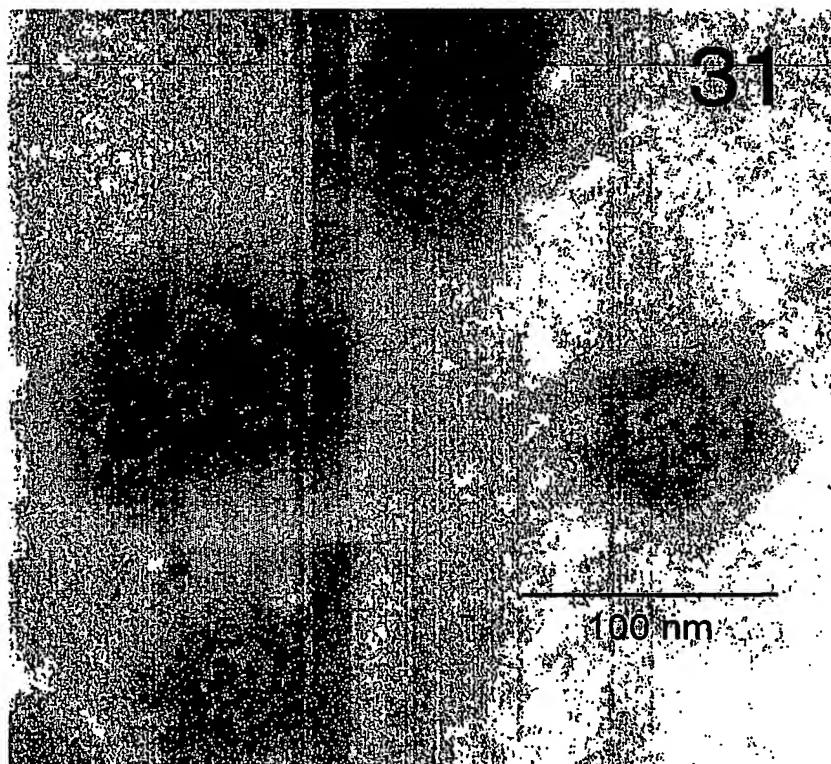


FIG.6